

**What is claimed is:**

1. A method for improving software availability of a cluster computer system including a number of primary servers and spare servers, said method comprising the  
5 following steps of:

collecting system state information about the number of primary servers to monitor unstableness of the servers;

if at least one of the servers is judged unstable as a result of monitoring, judging existence of a spare server or other primary server having spare capacity;

10 if at least one of the spare servers or the primary servers having spare capacity exists, duplexing all processes of the unstable primary server to the spare server or the other primary server having spare capacity according to a currently set operation mode; and

upon completing duplexing, providing the unstable server with a system  
15 rejuvenation control signal for executing rejuvenation.

2. A method for improving software availability of a cluster computer system according to claim 1, wherein said system state information contains at least one of group including operational load, continuous running time, memory usage, buffer usage  
20 of the primary server.

3. A method for improving software availability of a cluster computer system according to claim 1, wherein said set operation mode in said step of duplexing includes:

25 an active/standby mode in which a spare server exists without participating

service in practice for being used in duplexing; and

an active/active mode in which all of the servers constituting the cluster participate in service while mutually performing the role of the spare servers.

5           4. A method for improving software availability of a cluster computer system according to claim 1, wherein said step of duplexing comprises the steps of:

if the current mode is set as the active/standby mode, selecting any of the sparing servers; and

duplexing all the processes of the unstable primary server to the selected spare  
10 server.

5. A method for improving software availability of a cluster computer system according to claim 1, wherein said step of duplexing comprises the steps of:

if the current mode is set as the active/active mode, selecting any of the primary  
15 servers having spare capacity; and

duplexing all the processes of the unstable primary server to the selected primary server having spare capacity.

6. A method for improving software availability of a cluster computer system  
20 according to claim 1, wherein said step of executing rejuvenation comprises the steps of:

if the primary server subjected to rejuvenation is completed in duplexing, judging if to execute a rejuvenation command according to operational load and continuous running time of the primary server subjected to rejuvenation;

25 if it is judged to execute the rejuvenation command as a result of said step of

judging, canceling a list of the primary server subjected to rejuvenation from an available server list;

upon switching the duplexed spare server to the primary server, executing rejuvenation of the primary server subjected to rejuvenation; and

5 upon completing rejuvenation, registering the rejuvenation-completed primary server in the available server list as a spare server.

7. A method for improving software availability of a cluster computer system according to claim 6, wherein said rejuvenation of the primary server subjected to  
10 rejuvenation includes file system clearing, buffer clearing, memory clearing and restart.

8. An apparatus for improving software availability of a cluster computer system including a number of primary servers and spare servers, said apparatus comprising:

15 system monitoring means for collecting system state information about the number of primary servers to grasp an unstable state of each of the servers;

cluster controlling means for providing a control signal for duplexing all processes of a primary server to a spare server or other primary server having spare capacity according to a currently set operation mode if the primary server is unstable as  
20 a result of system monitoring in said system monitoring means, and for providing the unstable primary server with a rejuvenation signal for system rejuvenation if the unstable primary server maintains an unstable system state for a certain time period; and

duplexing means for duplexing all processes of the unstable primary server to the spare server or the other server having spare capacity according to a duplexing  
25 control signal about the set mode provided from said cluster controlling means.

9. An apparatus for improving software availability of a cluster computer system according to claim 8, wherein said system monitoring means comprises:

5 a system state information collecting block for monitoring a system state of each of the primary servers to collect state information of the each server; and

a rejuvenation command producing block for judging existence of an unstable primary server according to system state information collected in said system state information collecting block, and if any of the primary servers is unstable, producing a rejuvenation command signal for rejuvenation of unstable software of the unstable  
10 primary server and providing the same to said duplexing means.

10. An apparatus for improving software availability of a cluster computer system according to claim 8, wherein said system state information contains at least one information of group including operation load, continuous running time, memory usage,  
15 buffer usage of the servers.

11. An apparatus for improving software availability of a cluster computer system according to claim 8, wherein said cluster controlling means includes registering means for canceling the unstable primary server from an available server list when the  
20 unstable primary server is duplexed to the spare server or the other primary server having spare capacity in said duplexing means, and upon completing rejuvenation of the unstable primary server according to the rejuvenation signal, re-registering the rejuvenation-completed primary server in the available server list.

25 12. An apparatus for improving software availability of a cluster computer

system according to claim 8, wherein the operation mode set in said cluster controlling means includes an active/standby mode having a spare server existing without practically participating service for being used in duplexing; and

an active/active mode in which all the servers constituting the cluster participate  
5 in server while mutually performing the role of the spare servers.

13. An apparatus for improving software availability of a cluster computer system according to claim 8, wherein said duplexing means comprises:

a server selecting block for selecting a spare server or a primary server having  
10 spare capacity according to the operation mode set to said cluster controlling means;  
and

a duplexing block for duplexing all the processes of the unstable primary server to the primary server having spare capacity selected by said primary server selecting block when the operation mode is set as an active/active operation mode, and for  
15 duplexing all the processes of the unstable primary server to the spare server selected by said primary server selecting block when the operation mode is set as an active/standby operation mode.

14. A record medium readable by a digital processing apparatus and  
20 containing programs of command languages which can be executed by the digital processing apparatus for execution of a method for improving software availability of a cluster computer system including a number of primary servers and spare servers, said programs in the record medium can be executed in the following steps of:

collecting system state information about the number of primary servers to  
25 monitor unstableness of the servers;

if at least one of the servers is judged unstable as a result of monitoring, judging existence of a spare server or other primary server having spare capacity;

if at least one of the spare servers or the primary servers having spare capacity exists, duplexing all processes of the unstable primary server to the spare server or the  
5 other primary server having spare capacity according to a currently set operation mode;  
and

upon completing duplexing, providing the unstable server with a system rejuvenation control signal for executing rejuvenation.

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